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## NOTICE OF ALLOWANCE AND FEE(S) DUE

70001 7590 02/09/2009

NIXON PEABODY, LLP  
161 N. CLARK ST.  
48TH FLOOR  
CHICAGO, IL 60601-3213

EXAMINER

OCHOA, JUAN CARLOS

ART UNIT

PAPER NUMBER

2123

DATE MAILED: 02/09/2009

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/995,222

11/27/2001

Lars Langemyr

801939/111

9649

TITLE OF INVENTION: METHOD FOR ASSEMBLING THE FINITE ELEMENT DISCRETIZATION OF ARBITRARY WEAK EQUATIONS, INVOLVING LOCAL OR NON-LOCAL MULTIPHYSICS COUPLINGS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1510	\$300	\$0	\$1810	05/11/2009

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

### HOW TO REPLY TO THIS NOTICE:

#### I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

# **PART B - FEE(S) TRANSMITTAL**

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

70001 7590 02/09/2009

**NIXON PEABODY, LLP**  
161 N. CLARK ST.  
48TH FLOOR  
CHICAGO, IL 60601-3213

## **Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/95,222 11/27/2001 Lars Langemyr 801939/111 9649

TITLE OF INVENTION: METHOD FOR ASSEMBLING THE FINITE ELEMENT DISCRETIZATION OF ARBITRARY WEAK EQUATIONS, INVOLVING LOCAL OR NON-LOCAL MULTIPHYSICS COUPLINGS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
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nonprovisional NO \$1510 \$300 \$0 \$1810 05/11/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
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OCHOA, JUAN CARLOS 2123 703-002000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 \_\_\_\_\_

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 \_\_\_\_\_

3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee  
☐ Publication Fee (No small entity discount permitted)  
☐ Advance Order - # of Copies \_\_\_\_\_

4b. Payment of Fee(s); (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.  
☐ Payment by credit card. Form PTO-2038 is attached.  
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number \_\_\_\_\_ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature \_\_\_\_\_

Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_

Registration No. \_\_\_\_\_

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/995,222	11/27/2001	Lars Langemyr	801939/111	9649
70001	7590	02/09/2009	EXAMINER	
NIXON PEABODY, LLP 161 N. CLARK ST. 48TH FLOOR CHICAGO, IL 60601-3213			OCHOA, JUAN CARLOS	
			ART UNIT	PAPER NUMBER
			2123	
DATE MAILED: 02/09/2009				

## Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 474 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 474 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	09/995,222	LANGEMYR ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	JUAN C. OCHOA	2123	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 12/17/08.
2. ☒ The allowed claim(s) is/are 43-86.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
  - \* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☒ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 12/26/07.

**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. <input type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br/>Paper No./Mail Date <u>12/17/08</u></li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date _____.</li> <li>7. <input type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____.</li> </ol> |
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### **DETAILED ACTION**

1. The information disclosure statement filed 12/17/08 has been received. Claims 43-86 are presented for examination.

#### ***Continued Examination Under 37 CFR 1.114***

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 12/17/08 has been entered.

#### ***Information Disclosure Statement***

3. The information disclosure statement filed 12/17/08 has been considered.

#### ***Allowable Subject Matter***

4. Claims 43-86 are allowed over prior art of record.
5. Claims 43-69 are allowed over prior art of record for the means for language, in light of the arguments filed 6/26/08, (see page 16, 2<sup>nd</sup> paragraph), wherein Applicant invokes 112 sixth paragraph.

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6. Claims 70-86 are allowed over prior art of record.
7. The following is an examiner's statement of reasons for allowance:
8. Claim 70 utilizes "determining a representation of a set of one or more partial differential equations for each application mode corresponding to one of the plurality of systems using at least one non-local coupling and the one or more input physical properties, the at least one non-local coupling defining a value from a first portion of a first domain to another portion of a second domain",  
and claims 84 and 86 utilize "using the processor to generate a plurality of partial differential equations based on the first application mode, each of the partial differential equations representing a behavior of at least one physical quantity of the model in response to the set of physical properties; non-locally coupling one or more of the plurality of partial differential equations, the step of non-locally coupling including providing a value from a portion of a first domain to another portion of a second domain".
9. According to the specification (see page 31 of the PG-PUB of the instant application: U.S. PG-PUB 2003/0105614; or see page 118 of the filed specification):

Variables in FEMLAB are generally evaluated locally their value at each evaluation point is computed using information only from their evaluation point. In contrast, the value of a *coupling variable* is the result of a computation carried out elsewhere in the geometry or even in another geometry altogether. When used in the PDE and boundary conditions, the result is the introduction of non-local dependencies – *extended* multiphysics - as opposed to ordinary multiphysics, which refers to dependencies between variables in [the] same geometric location.

The coupling variables are extremely powerful in their ability to make the values of an expression available non-locally. The coupling variables are

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not only useful for modeling coupled problems - they can also be used solely for post processing and visualization purposes.

All coupling variables are defined in two steps. First define the *source*, i.e., the domains in which the evaluation takes place, the name of that evaluation, and the name given to the resulting variable; secondly define the *destination*, i.e. the domains within which it is possible to use the resulting variable.

There are three kinds of coupling variables implemented: scalar, extrusion, and projection.

10. The FEMLAB® Reference Manual, Version 1.0 is dated July 1998. This

reference pre-dates the priority filing date of the instant application. It teaches:

- a. “The core of FEMLAB is a set of algorithms for discretizing and solving Partial Differential Equations (PDE).” (see pages 3-21 to 3-27. The quote is on page 3-21).
- b. The use of Dirichlet and generalized Neumann boundary conditions in the coefficient form of PDE (see page 3-23).
- c. The use of Jacobians to solve PDE in the coefficient form (see pages 3-26 to 3-27), and a non-linear solver for obtaining the Jacobians (see pages 3-60 to 3-66).
- d. The “weak form” (or “variational form”) of the differential of the partial differential equation (see pages 3-40 to 3-41).

11. The FEMLAB® Reference Manual, Version 1.0, however, does not teach the use of “at least one non-local coupling” to determine a representation of a partial differential equation system.

12. The “FEMLAB 2.2: New Features” article teaches (see page 2):

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Automatic Jacobian computation for non-local couplings is now supported. You can access dependent variables non-locally, define scalar coupling variables by coordinate values or integration, and couple field variables by projection or extrusion.

The copyright date of this article is 2001, which post-dates the priority filing date of the instant application, and therefore does not qualify as prior art.

13. The FEMLAB® Installation and New Features Guide, Version 2.3 teaches that one new feature in Version 2.3 was "Improved contact problem handling using non-local coupling and nonlinear boundary conditions" (see page 6-41).

14. According to FEMLAB® Installation and New Features Guide, Version 2.3, printing history for the previous versions of the FEMLAB® Installation and New Features Guide is as follows:

- e. October 2000, First Printing, FEMLAB 2.0
- f. March 2001, Second Printing, FEMLAB 2.1
- g. November 2001, Third Printing, FEMLAB 2.2
- h. November 2002, Fourth Printing, FEMLAB 2.3

15. Therefore, FEMLAB® Installation and New Features Guide, Version 2.3 confirms that both FEMLAB versions 2.2 and 2.3 post-date the priority filing date of the instant application, and therefore do not qualify as prior art.

16. The Anderson reference, "Iterative Procedures for Nonlinear Integral Equations", teaches the use of strong local coupling (see page 548, par. 4; and page 549, par. 4), and the use of Jacobians (see page 549-551) for non-linear integral equations.

However, Anderson does not teach the use of non-local coupling, nor does Anderson expressly teach that his methods apply to Partial Differential Equations (PDE).



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17. The Ribeiro reference, "Non-linear Forced Vibrations of Thin/Thick Beams and Plates by the Finite Element and Shooting Methods" (see IDS dated 12/17/08), teaches that even for thin structures, when modal coupling occurs thin and thick theories give different results. This occurs because modal coupling brings higher order modes into the definition of the motion. As a result, beams and plates that can be studied employing thin theories in the linear domain, may quite possibly require that a thick theory is followed if their non-linear dynamic behaviour is to be accurately analysed (see page 1422, col. 2, last paragraph and page 1423, col. 1, 1<sup>st</sup> paragraph).

18. None of these references taken either alone or in combination with and in the same relationship with the prior art of record disclose claim 70 "determining a representation of a set of one or more partial differential equations for each application mode corresponding to one of the plurality of systems using at least one non-local coupling and the one or more input physical properties, the at least one non-local coupling defining a value from a first portion of a first domain to another portion of a second domain" and claims 84 and 86 "using the processor to generate a plurality of partial differential equations based on the first application mode, each of the partial differential equations representing a behavior of at least one physical quantity of the model in response to the set of physical properties; non-locally coupling one or more of the plurality of partial differential equations, the step of non-locally coupling including providing a value from a portion of a first domain to another portion of a second domain", in combination with and in the same relationship with the remaining elements and features of the claimed invention.

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19. Also, there is no motivation to combine none of these references to meet these limitations. It is for these reasons that applicant's method defines over the prior art of record.

20. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

21. As allowable subject matter has been indicated, applicant's reply must either comply with all formal requirements or specifically traverse each requirement not complied with. See 37 CFR 1.111(b) and MPEP § 707.07(a).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JUAN C. OCHOA whose telephone number is (571)272-2625. The examiner can normally be reached on 7:30AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on (571) 272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/J. C. O./ 1/29/09

Examiner, Art Unit 2123

/Paul L Rodriguez/

Supervisory Patent Examiner, Art Unit 2123